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Electrical Engineering

Communication Systems & Analog Electronics

Top 100 Most Expected Questions

1. For an amplitude modulated signal ratio of power of carrier after modulation to power of carrier before modulation, provided total modulation occurs.

A. 1 B. 1.5

C. 2 D. None of the above

Ans. B

Sol.: $P_t = P_c\left\{1+\frac{\mu^2}{2}\right\}$

$$\frac{P_t}{P_c} = 1+\frac{\mu^2}{2} = 1+\frac{12}{2} = 1+\frac{1}{2} = \frac{3}{2} = 1.5$$

2. If unmodulated carrier frequency and maximum frequency after modulation are 1 MHz and 1.4 MHz, respectively. Δf is _____ MHz.

A. 1.4 B. 0.6

C. 0.4 D. None of the above

Ans. C

Sol.: f_{max} = 1.4 MHz = f_c + Δf

1.4 = 1 + Δf

Δf = 1.4 – 1 = 0.4 MHz

3. The ability of receiver to reproduce the exact receiver output is termed as:

A. Sensitivity. B. Fidelity.

C. Selectivity. D. Double spotting.

Ans. B

Sol.: Fidelity of receiver is its ability to reproduce the exact replica of the transmitted signals at the receiver end.

→ For better fidelity, the amplifier must pass high fidelity, the amplifier must pass high bandwidth signals to amplify the frequencies of the outermost sidebands, while for better selectively the signal; should have narrow bandwidth. Thus a trade-off is made between selectivity and fidelity.

4. Consider a FM signal: s(t) = 10cos{2π × 10^6t + 8sin4π × 10^3t}. Its bandwidth will be _____kHz.

A. 18 B. 36

C. 16 D. 32

Ans. B

Sol.: s(t) = 10cos{2π × 10^6t+ 8sin 4π × 10^3t}

Comparing with

s(t) = $A_c$cos{2πf_ct + βsin2πf_mt}

50A_c = 10

f_c = 1000 K

β = 8

f_m = 2 K

So, BW = $2(1 + \beta)f_m = 2(1 + 8)(2K)$ = 36 kHz

5. Which of the following is not an advantage of turned radio frequency receives?

A. Simple in construction

B. High sensitivity

C. Performance is good at high frequency.

D. No problem of tracking and alignment.

Ans. C

Sol.: TRFRs has poor performance at high frequencies.

6. Three message signals, which are bandlimited to 10 kHz are multiplex using TDM. Each sample in encoded transmission bandwidth is:

A. 300 kHz B. 50 kHz

C. 100 kHz D. 150 kHz

Ans. D

Sol.: No. of multiplexed signals, N = 3

No. of bits/sample = 5

Message frequency f_m = 10 kHz

Sampling frequency, $f_s = 2f_m$ = 20 kHz

$\therefore$ bit rate, R_b = N x n x f_s = 3 × 5 × 20 kHz = 300 kbps

Transmission bandwidth = $\frac{R_b}{2} = 150\text{kHz}$

7. The value of SQNR in dB, if message signal is sampled at 8 kHz and transmitted through 512 level PCM system.

A. 54 B. 55

C. 55.8 D. 56.7

Ans. C

Sol.: f_s = 8 kHz

f_m = 4 kHz

$L = 512 = 2^9$

n = 9

So, $(SQNR)_{dB} = 1.8+(6n) = 1.8 + 6 \times 9 = 1.8 + 54 = 55.8$ dB

8. Band width requirement for telephone channel is _____.

A. 2 KHz B. 2 MHz

C. 4 KHz D. 4 MHz

Ans. C

Sol.: Telephone channel carries voice frequency is between 300 Hz to 3500 Hz.

So, B.W. = 3500 – 300 = 3200 Hz = 3.2 KHz

So, most appropriate option is 4 KHz

9. Video Signals are transmitted through_____

A. Frequency modulation B. Amplitude Modulation

C. Pulse Modulation D. Either A or B

Ans. B

Sol.: Video signals require a larger transmission Bandwidth for transmission. So modulation of video signals is Possible only by Amplitude modulation.

10. In an FM signal if the modulating signal frequency is doubled and modulating voltage is halved then the new value of frequency deviation Δf_m will be

A. $2\ \Delta f_m$ B. $4\ \Delta f_m$

C. $\Delta f_m/2$ D. $\Delta f_m/4$

Ans. C

Sol.: $\Delta f_m = k_f A_m$

A_m = modulating voltage

K_f = constant

$$\Delta f_m^{'} = k_f \frac{A_m}{2} = \Delta f_m / 2$$

11. Consider the following statements regarding single side band suppressed carrier (SSB – SC) modulation:

1) 50% of the channel bandwidth is saved compared to AM

2) 50% of the power will be saved compared to AM

3) SSB-SC is preferred over vestigial side band modulation for transmitting video signals.

Which of the above statements is/are correct?

A. 1 and 2

B. only 1

C. 2 and 3

D. only 2

Ans. B

Sol.: In SSB-SC the bandwidth required is equal to maximum frequency present in the signal.

Power saved depends on modulation index

$$\%\ \text{power saved} = \frac{\text{Power saved}}{\text{Total power in AM}} \times 100 = \frac{P_c + \frac{P_c \mu^2}{4}}{P_c\left[1 + \frac{\mu^2}{2}\right]} = \frac{4+\mu^2}{4+2\mu^2} \times 100$$

VSB is preferred for video signals whereas SSB-SC is used for audio signals

12. A multitone amplitude modulation has two modulated signal frequencies ω_{m1} and ω_{m2} ($\omega_{m2} > \omega_{m1}$) then the bandwidth required is

A. $\omega_{m1} + \omega_{m2}$ B. ω_{m2}

C. $2(\omega_{m1} + \omega_{m2})$ D. $2\ \omega_{m2}$

Ans. D

Sol.: The bandwidth of a multitone amplitude modulated signal is two times the maximum frequency present in modulated signal.

13. Consider the following statements regarding PDF and CDF:

1) A probability cumulative distribution function can be non-increasing or monotonically increasing.
2) Maximum value of a probability distribution function is 1

Which of the above statements is/are correct?

A. only 1 B. only 2

C. Both 1 and 2 D. Neither 1 nor 2

Ans. A

Sol.: A probability CDF should be monotonically increasing or non-increasing, but it should not decrease as the probabilities are getting added.

The maximum value of probability density function can be greater than 1.

14. A signal is to be digitally encoded with a resolution of 0.02%. The voltage range is 0 – 8V. What is the analog value of LSB?

A. $1/2^6$ B. $1/2^{13}$

C. $1/2^{10}$ D. $1/2^9$

Ans. C

Sol.: Resolution = 0.02%

No of quantization levels $= \frac{100}{.02} = 5000$

Minimum no of bits required

$2^N > 5000 \Rightarrow N = 13$

Analog value of LSB $= \frac{1}{2^{13}} \times 8 = \frac{1}{2^{10}}$

15. For a tuned radio frequency receiver the correct sequence of following devices from input to output is

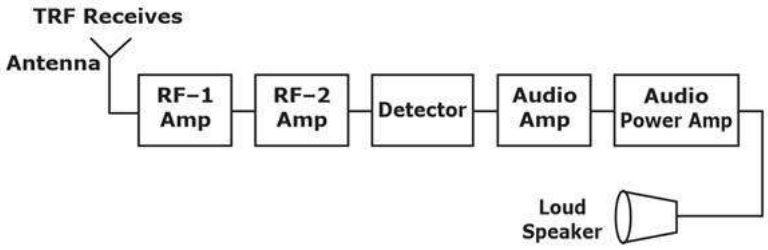
1) Antenna
2) RF Amplifier
3) Detector
4) Audio amplifier
5) Power amplifier

A. 1, 3, 2, 4, 5 B. 1, 2, 3, 4, 5

C. 1, 2, 3, 5, 4 D. 1, 3, 2, 5, 4

Ans. B

Sol.:



16. The PDF of a Cauchy distributed random variable X is $f_x(x) = \frac{b/\pi}{x^2+b^2}, -\infty < x < \infty$.

The value of E[X] is

A. $\frac{1}{\pi b}$ B. 0

C. $\frac{b}{\pi}\ln b$ D. $\frac{b}{2\pi}\ln b$

Ans. B

Sol.: Since the function $f_x(x)$ is symmetric about y – axis (x = 0) so

$$E(x) = \int_{-\infty}^{\infty} x f(x) dx = 0$$

17. Consider the following statement regarding pre-emphasis and De-emphasis:

1) Pre-emphasis and De-emphasis techniques are used to improve fidelity of receiver.
2) Pre-emphasis is the process of artificial boosting of high frequency component of original signal to increase corresponding SNR.
3) De-emphasis will be done after demodulation.

Which of the above statements are correct?

A. 1 and 2 B. 2 and 3

C. 1 and 3 D. 1, 2 and 3

Ans. D

Sol.: Fidelity is the ability of receives to produce all frequency components of transmitted message signal.

Pre-emphasis and De-emphasis are used to improve fidelity of receives.

Pre-emphasis is the process of boosting original signal high frequency component to increase SNR.

De-emphasis is the reverse of pre-emphasis and will be done after demodulation.

18. For an FM signal, unmodulated carrier frequency in MHz is_____, provided, f_{max} = 1.5 MHz, Δf = 450 kHz.

A. 1050 B. 1.5

C. 1.05 D. 105

Ans. C

Sol.: Δf = 450 kHz

f_{max} = 1.5 MHz = f_c + Δf

$f_c = f_{max} - \Delta f = 1.5 \times 10^6 - 450 \times 10^3 = 1050$ K = 1.05 MHz

19. Consider the following statements about fiber optic communication:

1) A fiber transmission system has distance bandwidth product constant for distortion less transmission.
2) LEDs and laser diodes act as transmitters
3) Optical fibers cannot be used in areas with high electromagnetic interference

Which of the above statements is/are correct?

A. 1 and 2 B. 2 and 3

C. 1 and 3 D. 1, 2 and 3

Ans. A

Sol.: A fiber transmission system has generally rated bandwidth – distance in MHz-Km.

A 500 MHz-Km means it can transmit 500 MHz signal upto 1 Km or 1000 MHz signal upto 0.5 Km.

Here is a tradeoff between distance and bandwidth.

Most commonly used transmitters are LEDs and Laser diodes.

Optical fiber is immune to noise and electromagnetic interference due to non-metallic nature of wire.

20. A signal having peak to peak voltage of 7 V is given to a PCM system having step size of 1 V. The signal to quantization noise ratio in dB is:

A. 25.8 dB

B. 15.6 dB

C. 36 dB

D. 19.8 dB

Ans. D

Sol.: $\Delta = \frac{V_{P.P}}{2^{n-1}} = \frac{7}{2^{n-1}}$

$1 = \frac{7}{2^{n-1}} \Rightarrow n = 3\text{bits}$

Here Δ is step size.

$(SQNR)_{dB}$ = (1.8 + 6n) = 1.8 + 6 × 3 = 19.8 dB

21. In digital modulation companding is done to

A. Compensate variation of step size in quantization.

B. to improve fidelity of receiver

C. boosting high frequencies transmitter

D. None of the above

Ans. A

Sol.: Companding is a process of expanding low amplitude signals and compressing high amplitude signals at transmitters and reverse is done at receiver. This can be done before quantization.

22. A message signal is transmitted through 250 level PCM system. This message signal is band limited to 4 kHz. The system BW is _____ kHz.

A. 8 B. 2

C. 16 D. 32

Ans. D

Sol.: f_m = 4 kHz

L = 256 ⇒ 2^8⇒ n = 8

as $f_s = 2f_m$ = 8 kHz

So, $BW = \frac{nf_s}{2} = \frac{8\times 8k}{2} = 32kHz$

23. **Statement 1:** An 8-bit PCM system perform better than a 6-bit PCM system.

Statement 2: 8-bit PCM system requires more channel bandwidth than 6-bit PCM system.

A. Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

B. Both statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)

C. Statement (I) is true but Statement (II) is false

D. Statement (I) is false but Statement (II) is true

Ans. B

Sol.: 8-bit PCM system performs better than 6-bit PCM system as it produces smaller quantization noise.

As no of bits increases, quantization step size decreases hence quantization noise power decreases.

In case of PCM bandwidth requirement is directly proportional to no of bits.

24. Consider the following statements regarding FM and AM

1) FM is more immune to noise than AM

2) FM requires higher bandwidth compared to AM

3) FM requires more modulating power than AM

Which of the above statements is/are not correct?

A. 1 and 3 B. 1 and 2

C. Only 2 D. only 3

Ans. D

Sol.: FM is more immune to noise than AM

$(BW)_{AM} = 2\ f_m$

$(BW)_{FM} = 2(\beta+1)f_m$

In case of FM, modulating power before and after the modulation remains same whereas it increases in case of AM.

25. **Statement 1:** In amplitude modulation, if modulation index is greater than 1 then the signal cannot be detected by envelope detectors.

Statement 2: In case of over modulation message signal is not completely stored in positive envelope.

A. Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

B. Both statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)

C. Statement (I) is true but Statement (II) is false

D. Statement (I) is false but Statement (II) is true

Ans. A

Sol.: For modulation index $\mu > 1 \Rightarrow A_m > A_c$

$$\mu = \frac{A_{max} - A_{min}}{A_{max} + A_{min}} > 1$$

$$\Rightarrow A_{min} = \text{negetive}$$

Hence it cannot be detected by envelope detectors as it cannot detect the signal less than zero, For detection of such signals synchronous detectors has to be used.

26. भाषा-शिक्षण में अनिवार्य है

A. मानक भाषा पर बल

B. समग्रतावादी दृष्टिकोण

C. विशेष आवश्यकता वाले बच्चों के साथ भिन्न व्यवहार

D. वर्तनी संबंधी गृहकार्य

Ans. B

Sol.: भाषा-शिक्षण में अनिवार्य है-समग्रतावादी दृष्टिकोण

अतः सही उत्तर विकल्प B है।

27. The internal state of neuron is called _____, is the function of the inputs the neurons receives.

A. Weight

B. activation or activity level of neuron

C. Bias

D. None of these

Ans. B

28. Which of the following is not an advantage of pulse code modulation?

A. Private and secured Communication B. Complexity of the system decreases.

C. Immunity to noise and interference D. Regeneration of coded signals along the path.

Ans. B

Sol.: For a PCM, complexity of the system increases, and transmission bandwidth requirement is also high.

Rest all are advantage of PCM.

29. In AM modulation, the equation of the modulating signal is given by $f(t) = A_m \cos(\omega_m t)$. If the amplitude of the carrier wave is A and there is no over-modulation, the modulation efficiency will be

A. 33.4% B. 38.6%

C. 43.3% D. 48.6%

Ans. A

Sol.: For under critically modulation, $\mu \leq 1$

For critical or maximum modulation $\mu = 1$

$$\text{Modulation efficiency } (\eta) = \frac{\text{Useful Power}}{\text{Total power}} = \frac{P_{SB}}{P_T} = \frac{P_c \frac{\mu^2}{2}}{P_c\left(1+\frac{\mu^2}{2}\right)}$$

$$\eta = \frac{\mu^2}{2+\mu^2}$$

$$\eta = \frac{1}{2+1} = \frac{1}{3} \times 100 = 33.3\%$$

30. **Statement 1:** In case of time division multiplexing, the speed of commutator is equal to nyquist rate of highest frequency is preferred.

Statement 2: Channel bandwidth requirement will be minimum when speed of commutator is equal to nyquist rate of lowest frequency.

A. Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

B. Both statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)

C. Statement (I) is true but Statement (II) is false

D. Statement (I) is false but Statement (II) is true

Ans. D

Sol.: When the speed of commuators is equal to nyquist rate of lowest frequency, channel bandwidth requirements are minimum. Hence this case is preferred.

31. In AM signal when the modulation index is 0.5, the maximum power P_t, (where P_c is carrier power) is equal to_____.

A. P_c B. $2.5P_c$

C. $2P_c$ D. $1.125P_c$

Ans. D

Sol.: $P_t = P_c * \left(1+\frac{m^2}{2}\right)$

$$P_t = \left(1+\frac{0.5^2}{2}\right) * P_c = 1.125P_c$$

32. Consider the following statements:

A. Both statement (i) and statement (ii) are true, and statement (ii) is the correct explanation of statement (i)

B. Both statement (i) and statement (ii) are true, but statement (ii) is not the correct explanation of statement (i)

C. Statement (i) is true, but statement (ii) is false

D. Statement (i) is false, but statement (ii) is true

Statement (i): The process of extracting an original message signal from the modulated wave is known as demodulation.

Statement (ii): Envelope Detector is one of the famous demodulators used for demodulating AM wave.

A. A B. B

C. C D. D

Ans. B

Sol.: The process of extracting an original message signal from the modulated wave is known as detection or demodulation. The circuit, which demodulates the modulated wave is known as the demodulator. The following demodulators (detectors) are used for demodulating AM wave.

1. Square Law Demodulator
2. Envelope Detector

Square law demodulator is used to demodulate low level AM wave. This demodulator contains a square law device and low pass filter. Envelope detector is used to detect (demodulate) high level AM wave. This envelope detector consists of a diode and low pass filter. Here, the diode is the main detecting element. Hence, the envelope detector is also called as the diode detector. The low pass filter contains a parallel combination of the resistor and the capacitor.

So both statements are correct, but statement (ii) is not correct explanation of statement (i).

33. Match List-I wish List-II and select the correct answer using the code given below the lists:

List-I	List-II
A. Video signal(TV)	1. Square-law detector
B. FM	2. Transmitted power constant
C. AM	3. AM waves

A. A-2 B-1 C-3

B. A-1 B-2 C-3

C. A-3 B-1 C-2

D. A-3 B-2 C-1

Ans. D

Sol.: Amplitude modulation detectors are of two types:

1) Square Law detector

2) Envelope detector

In frequency modulation the transmitted power is constant

Video signal transmits data by AM waves only.

34. Consider the following statements about noise.

1) Solar noise refers to the interference of broad frequency spectrum radiated by the sun with the communication signals.
2) White noise is due to rapid and random motion of the molecules inside the component itself.
3) Thermal noise is also called Gaussian noise as it follows Gaussian probability density function.

Which of the above statements is/are correct?

A. 2 and 3 only

B. 1 and 2 only

C. only 1

D. 1, 2 and 3

Ans. D

Sol.: All the statements are correct.

Solar noise is due to broad frequency spectrum radiated by sun.

White noise or thermal noise is due to the rapid and random motion of the molecules inside the component. It is also called Gaussian noise is follows Gaussian probability density function.

35. The value of image frequency in kHz, provided receiver is tuned to 600 kHz and intermediate receiver is tuned to 600 kHz and intermediate frequency is 500 kHz.

A. 1100 B. 100

C. 1600 D. 1700

Ans. C

Sol.: f_s = 600 kHz

f_i = 600 kHz

f_i = 500 kHz

$f_{si} = f_s + 2f_I = 600 + 2 \times 500 = 1600$ kHz

36. **Statement 1:** For values of modulation index less than 0.3 in FM there are only two sidebands.

Statement 2: For large values of β in FM the FM wave will contain a carries and infinite numbers of sidebands.

A. Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

B. Both statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)

C. Statement (I) is true but Statement (II) is false

D. Statement (I) is false but Statement (II) is true

Ans. A

Sol.: In theory for large values of β more than 1 radian, FM contains a carries and infinite no of sidebands placed symmetrically around the carries. This is said to be wideband FM.

37. For practical purpose, the signal to noise ratio for acceptable quality transmission of analog signals and digital signals respectively are

A. 10-30 dB and 5-08 dB B. 40-60 dB and 10-12 dB

C. 60-80 dB and 20-24 dB D. 70-90 dB and 30-36 dB

Ans. B

Sol.: For practical or commercial purposes,

The signal to noise ratio for acceptable quality of transmission of analog signals and digital signals are respectively:

Analog Signals: 40-60 dB

Digital Signals: 10-12 dB

38. Carrier signal is having 10 MHz frequency. The carrier signal is frequency modulated by sinusoidal signal of 500 Hz. Bandwidth using Carson's rule is _____kHz if maximum frequency deviation is 50 KHz.

A. 100 B. 101

C. 102 D. 103

Ans. B

Sol.: By Carson's Rule,

BW = 2 ($\Delta f + f_m$) = 2(50 + 0.5) kHz = 101 kHz

39. In TV, video signals are transmitted through _____.

A. frequency modulation

B. pulse modulation

C. amplitude modulation

D. phase modulation

Ans. C

Sol.: Amlitude modulation gets more affected by noise in comparison to FM signals. Since Ear can hear the minute distortions in audio signals,hence they are transmitted through FM transmission. Whereas video signals with minute distortions doesnt show any difference when displayed on screen.

40. Consider the following statements:

A. Both statement (i) and statement (ii) are true, and statement (ii) is the correct explanation of statement (i)

B. Both statement (i) and statement (ii) are true, but statement (ii) is not the correct explanation of statement (i)

C. Statement (i) is true, but statement (ii) is false

D. Statement (i) is false, but statement (ii) is true

Statement (i): Balanced modulator consists of four identical AM modulators.

Statement (ii): The transmission of a signal, which contains a carrier along with two sidebands is termed as DSBFC.

A. A

B. B

C. C

D. D

Ans. D

Sol.: Balanced modulator consists of two identical AM modulators. These two modulators are arranged in a balanced configuration in order to suppress the carrier signal. Hence, it is called as Balanced modulator. The same carrier signal is applied as one of the inputs to these two AM modulators. The modulating signal is applied as another input to the upper

AM modulator. Whereas the modulating signal with opposite polarity is applied as another input to the lower AM modulator. So, statement (i) is incorrect.

The transmission of a signal, which contains a carrier along with two sidebands can be termed as Double Sideband Full Carrier system or simply DSBFC. So, statement (ii) is correct.

41. A FM generator has frequency sensitivity of 40 Hz/volt. Modulating signal having amplitude 5 V and frequency 2000 HZ is applied to this FM generator. Frequency modulation is _____. (Consider modulating signal to be sinusoidal).

A. 2 Hz
B. 20 Hz
C. 200 Hz
D. 2000 Hz

Ans. C

Sol.: Amplitude of modulating signal, A_m = 5 V & f_m = 2000 Hz

Frequency sensitivity, $K_f = 40\text{Hz/Volts}$

Δf = Frequency deviation = $K_f A_m = 40 \times 5 = 200$ Hz

42. The transmission power efficiency for a tone modulated signal with modulated index of 0.5 will be nearly

A. 6.7%
B. 11.1%
C. 16.7%
D. 21.1%

Ans. B

Sol.: μ = 0.5

$$\text{Transmission efficiency} = \frac{\mu^2}{2+\mu^2} = \frac{(0.5)^2}{2+(0.5)^2} = 11.1\%$$

43. V=A sin($w_c t$ + m.sin $w_m t$) is the expression for

A. Amplitude modulated signal
B. Frequency modulated signal
C. Phase modulated signal
D. Carrier signal used for modulation

Ans. C

Sol.: For a given equation of angle modulated wave, it is not possible to determine whether it is FM or PM signal. However, if both the carrier wave and message signal are sinusoidal function, we can determine the nature of modulated signal.

Let, the carrier be $S_c(t) = A\sin\omega_c t$ and message signal be $m(t) = A_m \sin\omega_m t$

The expression for FM signal will be:

$$S_{FM}(t) = A\sin\left(\omega_c t + k_t\int_0^{\cdot} m(t)dt\right) = A\sin\left(\omega_c t + K_t\int_0^{\cdot}\sin\omega_m t\right)$$

$$S_{FM}(t) = A\sin\left(\omega_c t - \frac{k_t A_m}{\omega_m}\cos\omega_m t\right) = A\sin\left(\omega_c t - m\cos\omega_m t\right)$$

where m = Modulation index of FM

The expression for PM signal will be:

$$S_{FM}(t) = A\sin\left(\omega_c t + k_p m(t)\right) = A\sin\left(\omega_c t + k_p A_m \sin\omega_m t\right)$$

$$\therefore\ S_{FM}(t) = A\sin\left(\omega_c t + m\sin\omega_m t\right)$$

Among the given options and assuming both carrier & message signal to be sine wave, the expression is of a phase modulated signal.

44. The Shannon limit for information capacity I is

A. $B\log_2\left(1-\frac{S}{N}\right)$

B. $B\log_2\left(1+\frac{S}{N}\right)$

C. $B\log_{10}\left(1-\frac{S}{N}\right)$

D. $B\log_{10}\left(1+\frac{S}{N}\right)$

Ans. B

Sol.: Where:

N = Noise power (W)

B = Bandwidth (Hz)

S = Signal power (W)

Shannon limit for information capacity is given by

$$I = B\log_2\left(1+\frac{S}{N}\right)$$

Where:

N = Noise power (W)

B = Bandwidth (Hz)

S = Signal power (W)

45. In a time division multiplexing, there are 8000 samples for a digital signal-0 channel that uses 8 kHz sample rate and 8-bit PCM code. The line speed will be

A. 56 kbps B. 64 kbps

C. 70 kbps D. 84 kbps

Ans. B

Sol.: The DS0 rate was introduced to carry a single digitized voice call. For a typical phone call, the audio sound is digitized at an 8 kHz sample rate, or 8000 samples per second, using 8-bit pulse code modulation for each of the samples. This results in a data rate of 64 kbps.

46. Which one of the following statement is not correct?

A. FM has infinite number of side-bands

B. Modulation index for FM is always greater than one

C. As modulation depth increase the BW increases

D. As modulation depth increase the sideband power increases

Ans. B

47. The de-emphasis filter in an FM receiver comes

A. Before FM demodulator

B. After FM demodulator and before baseband filter

C. After baseband filter

D. Before RF amplifier

Ans. B

48. The main advantage of pre-emphasis circuit in FM transmitter is

A. To increase the carrier power

B. To improve the signal to noise ratio at low audio frequencies

C. To increase the bandwidth of side band

D. To improve the signal to noise ratio at high audio frequencies

Ans. D

Sol.: In FM frequencies are more affected by the noise compare to low frequencies so preemphasis is done to amplify high frequency and pass the low frequency and pass the low frequency as it is so to improve (S/N) ratio at receiver end at high frequencies.

49. A random communication signal has PDF P(x) = ae^{-bx}, for $-1 \le X \le 1$ and b = 1 then value of a is

A. $\frac{e}{e^2-1}$

B. $\frac{e}{e-1}$

C. $\frac{1}{2}$

D. 2

Ans. A

Sol.: PDF, $\int_{-\infty}^{\infty} P(x) = 1$

$$\int_{-1}^{1} ae^{-bx} dx = 1$$

$$\frac{-a}{b}\left[e^{-bx}\right]_{-1}^{1} = 1$$

$$\frac{-a}{b}\left[e^{-b} - e^{b}\right] = 1$$

But b = 1

$-a\,[e^{-1} - e] = 1$

$$a = \frac{1}{e - e^{-1}} = \frac{e}{e^2 - 1}$$

50. Consider the following statements regarding envelope detector:

1) Charging time constant of the capacitor should be high for proper envelope detection.
2) Discharging time constant should be at an optimum value i.e. neither too high nor too low.
3) For an AM wave with carrier frequency 2MHz and message frequency 5 kHz the discharging time constant = 100 μsec will result in proper envelope detection.

Which of the above statements are correct?

A. 1 and 2 B. 2 and 3

C. 1 and 3 D. 1, 2 and 3

Ans. B

Sol.: Charging time constant should be very small so that capacitor charges quickly to the peak value of modulated signal.

Discharge time constant should be

$$\frac{1}{f_c} < R_L C < \frac{1}{f_m}$$

0.5×10^{-6} sec < $R_L C$ < 0.2×10^{-3} sec

$R_L C$ = 100 μsec satisfies the criteria

51. A Schottky diode is a:

A. Fast recovery diode

B. Majority carrier device

C. Minority carrier device

D. Both Majority and minority carrier device

Ans. B

Sol.: Schottky diode is formed by the junction of a semiconductor with a metal such as gold, silver or platinum having only the majority carriers.

52. A major advantage of active filter is that they can be realized without using.

A. Resistor

B. Inductor

C. Capacitor

D. Op-amps

Ans. B

Sol.: Active filter consists of active element like op-amps and passive element like Resistor and capacitor. It can be realized without using inductors.

53. Which of the following is pentavalent impurity?

A. Gallium B. Boron

C. Antimony D. Indium

Ans. C

Sol.: Antimony has 5 electrons in its outer most orbit. So antimony is pentavalent impurity.

54. The correct statements regarding output characteristics of a BJT is/are [For common base connection].

1. It is the curve between collector current I_C and collector-base voltage V_{CB} at constant emitter current I_E.
2. While drawing the characteristic, V_{CB} is kept constant.
3. The collector current I_C change with V_{CB} at all voltages.
4. I_C changes with change in I_E.

A. 1, 3, and 4 B. 1, 2 and 3

C. 1 and 4 D. 1 Only

Ans. A

Sol.: Output characteristic is done between I_C and V_{CB} at constant I_E.

I_C varies with V_{CB} only at low voltages (</V) above this voltage, I_C becomes constant.

Value of I_C is different for different values of I_E.

55. Consider the following statements for different configuration of BJT?

1. Common emitter configuration has high voltage and current gains.
2. Common base configuration is used for audio frequency applications.
3. Current gain of common base configuration is less than 1.
4. Common emitter is used for impedance matching.

Which of the above statements are correct?

A. 1, 2 and 3 B. 1 and 3

C. 3 and 4 D. 2, 3 and 4

Ans. B

Sol.:

Configuration	Applications	Voltage gain	Current gain
CB	High frequency	High	<1
CE	Audio frequency	High	High
CC	Impedance matching	<1	High

56. A junction field effect transistor:

A. Is a current controlled device.

B. Has low input impedance.

C. Has negative temperature coefficient of resistance.

D. Has zero drain current above pinch off voltage.

Ans. C

Sol.: JEET is a voltage-controlled device.

It has very high input impedance.

It has negative temperature coefficient of resistance. Therefore, it is not subjected to thermal runway.

Above pinch off voltage, drain current becomes constant (not zero).

57. Threshold voltage in transfer characteristics of MOSFET is the:

A. Minimum voltage required to turn off the device.

B. Minimum voltage required to induce a channel for conduction.

C. Voltage at which breakdown of device will occur.

D. None of the above.

Ans. B

Sol.: The minimum value of VGS that turns the MOSFET ON is called threshold voltage.

When V_{GS} is less than $V_{GS(th)}$, there is no induced channel and drain current is zero.

When V_{GS} is equal to $V_{GS(th)}$, channel is induced and MOSFET is turned on.

58. When maximum reverse-biasing voltage is applied between the collector and base terminals of the transistor and emitter is open circuited, breakdown occurs due to

A. Avalanche breakdown

B. Avalanche multiplication

C. Punch-through

D. Reach-through

Ans. B

Sol.: For Avalanche multiplication,

$$\beta V_{CEO} = \frac{\beta V_{CBO}}{(\beta)^{1/n}}$$

here, n = avalanche multiplication factor

As reverse bias voltage increases between collector and base terminals and emitter is open circuited, large current passes through collector junction, the collector break-down occurs. This break-down occurs due to avalanche effect (or) avalanche multiplication.

59. A depletion-type MOSFET can be operated in as enhancement mode where negative charges are induced into n-type channel by applying

A. Positive Gate Voltage

B. Negative Gate Voltage

C. Positive Drain Voltage

D. Negative Drain Voltage

Ans. A

Sol.: When gate voltage is positive, the N-channel depletion MOSFET operates in enhancement mode and when gate voltage is negative. It operates in depletion mode.

60. During a low frequency response of an amplifier which is invariably of RC-coupled type, there is a range of frequency characteristics over which the amplification is constant, and delay is also constant, called

A. Low band frequency

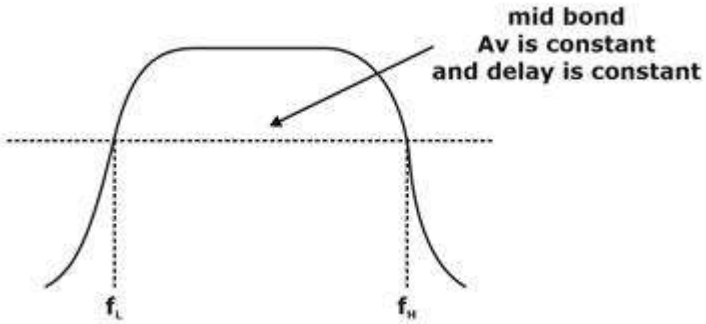
B. Mid band frequency

C. High band frequency

D. Hyper band frequency

Ans. B

Sol.: For amplifier, frequency response characteristics are divided into low, mid and high frequency. the transistor amplifier amplifies the signal faithfully in mid bond frequency only. RC coupled frequency response is shown in figure.



61. Which of the following transistor configuration circuit is much less temperature dependent?

A. Common base
B. Common collector
C. Common emitter
D. None of the above

Ans. B

Sol.: Common collector configuration is less temperature dependent.

62. If the value of α is 0.9, then the value of β is _____

A. 0.1
B. 900
C. 90
D. 9

Ans. D

Sol.: $\beta = \frac{\alpha}{1-\alpha} = \frac{0.9}{1-0.9} = 9$

63. Increasing the collector supply voltage will increase

A. Base current
B. Emitter current
C. Collector current
D. None of the above

Ans. D

Sol.: By increasing the collector supply voltage load voltage can increased at output side. It does not affect the any of the above mentioned current.

64. For FET, Bandwidth in kHz provided:

g_m = 9.5 mA/V

Total capacitance = 500 × 10^{-12} F

Voltage gain = (−30)

A. 100
B. 200
C. 300
D. 400

Ans. A

Sol.: $A_v \times f_H = \frac{g_m}{2\pi C_{eq}}$

$A_v = -30$

$f_H = \frac{9.5\times10^{-3}}{-30\times2\pi\times500\times10^{-12}} = 100.798 = 100$ kHz

65. The expression for the transconductance for JEET is given by:

A. $g_m = \frac{2I_{DSS}}{|V_P|}\left[1-\frac{V_{GS}}{V_p}\right]$

B. $g_m = \frac{I_{DSS}}{|V_P|}\left[1-\frac{V_{GS}}{V_P}\right]$

C. $g_m = \frac{2I_{DSS}}{|V_{GS}|}\left[1-\frac{V_{GS}}{V_P}\right]$

D. $g_m = \frac{2I_{OSS}}{V_{GS}}\left[1-\frac{V_{GS}}{V_P}\right]^2$

Ans. A

Sol.: Transconductance is given as: $g_m = \frac{\Delta I_0}{\Delta V_{GS}}\Big|_{\text{Q-point}} = \frac{dI_\circ}{dV_{GS}}\Big|_{\text{Q-point}}$

Drain current, $I_D = I_{DSS}\left(1-\frac{V_{GS}}{V_P}\right)^2$

$g_m = \frac{2I_{DSS}}{|V_P|}\left[1-\frac{V_{GS}}{V_P}\right]$

Here, $|V_P|$ denotes magnitude only to ensure a positive value of g_m.

66. The lower turn off time MOSFET when compared to BJT can be attributed to which one of the following?

A. Input impedance

B. Positive temperature coefficient

C. Absence of minority carriers

D. On-state resistance

Ans. C

Sol.: During turnoff in case of BJT storage time required to sweptout the minority carriers from n and p regions and this is not required in case of MOSFET because it is a majority carrier device so lesser turnoff time.

67. When $V_{GS} = 0$ V, a JFET is act as

A. Open switch

B. Cut off

C. Saturated

D. None of the Above

Ans. C

Sol.: When $V_{GS} = 0$ V, a JFET works in saturated region.

68. Output voltage in volts for transistor circuit shown below is _____, provided:

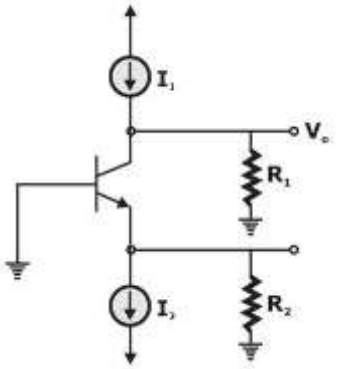
$I_1 = 6$ mA

$I_2 = 2$ mA

$R_1 = R_2 = 1\ k\Omega$

$V_{BE} = 0.7\ V$

$\beta \to \infty$



A. 4.7 B. –4.7

C. 5.3 D. –5.3

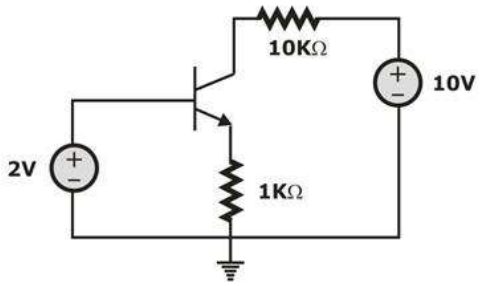
Ans. A

Sol.: $V_E = -0.7\ V$

$I_E = 2\ mA - 0.7\ mA = 1.3\ mA = I_C$

$V_o = (6\ mA - 1.3\ mA) \times 10\ k\Omega = 4.7\ V$

69. For the BJT shown in the figure, identity the region of openation. Assume β is very large.



A. Cut-off B. Active

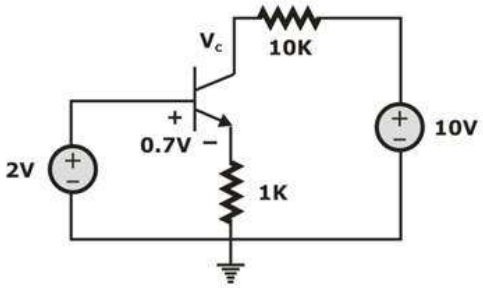
C. Saturation D. Reverse active

Ans. C

Sol.: Applying KVL in loop

$-2+0.7+I_E \times 1k=0$

($V_{RE} = 0.7V$)



I_E = 1.3Ma

Since β is very large. $I_c \approx I_E$= 1.3mA.

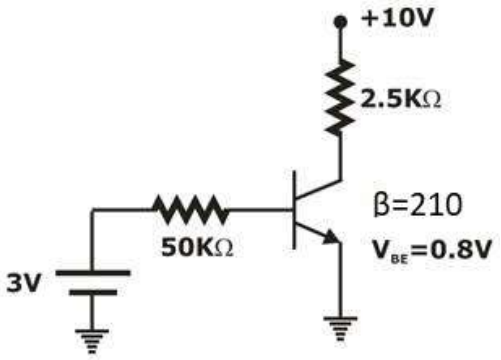
Now V_C = 10 – 10 k× 1.3 [considering B J T is in active region] = –3V

But V_B = 2V

For BJT to be in active region, base collector junction should be reverse biased.

But here $V_C < V_B$, hence it is forward biased. So, BJT is in saturation region.

70. In the given figure, the collector current is?



A. 0 mA
B. 3.92 mA
C. 9.24 mA
D. 0.044 mA

Ans. B

Sol.: Consider transistor is in saturation.

V_{CE} = 0.2V

$$I_{C(sat)} = \frac{10-0.2}{2.5k} = 3.92mA$$

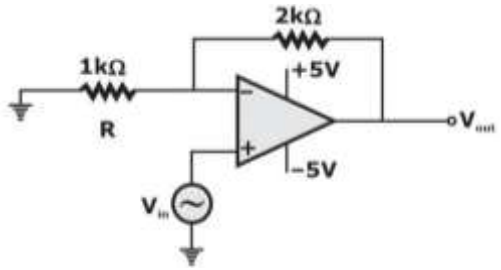
$$I_{B(athe)} = \frac{3-0.8}{50k} = 44\mu A$$

$I_{C\,(active)}$= BTB = 210× 44× 10^{-3} = 9.24 mA

$I_{C(sat)} < I_{C(active)}$

Saturation Region. I_C = 3.92 mA

71. The nature of feedback in the op-amp circuit shown is



A. Current-current feedback
B. Current-voltage feedback
C. Voltage-current feedback
D. Voltage-voltage feedback

Ans. D

Sol.: Feedback resistance is directly connected to output voltage in shunted form hence voltage sampling at output.

Input voltage is not directly connected to feedback resistance hence, series mixing.

So, the nature of feedback in the op-amp is voltage-voltage feedback.

72. A cascade amplifier consists of

A. A common emitter stage followed by a common emitter stage.

B. A common emitter stage followed by a common collector stage.

C. A common emitter stage followed by a common base sage.

D. A common collector stage followed by a common by a common base stage.

Ans. C

Sol.: A cascade amplifier has two stages, base stage higher input isolation, Higher input impedance, higher output impedance, higher bandwidth.

73. An amplifier has an open loop gain of 50 and input impedance 2 kΩ and output impedance 500 Ω. If negative feedback with feedback factors 0.8 is connected in current series feedback. The new input and output impedances are

A. 82 kΩ & 20.5 kΩ

B. 82 kΩ & 12.2 kΩ

C. 487.8 Ω & 20.5 kΩ

D. 487.8 Ω & 12.2 Ω

Ans. A

Sol.: In current series feedback:

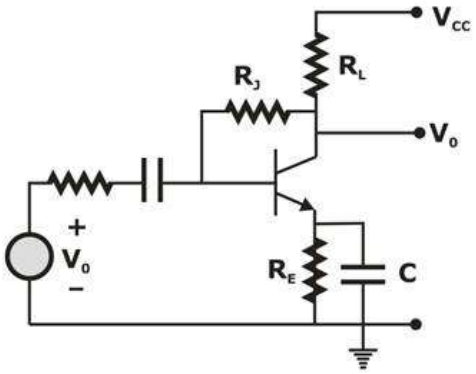
$R_{if} = (1 + A\beta)$

$R_{of} = R_o(1 + A\beta) = 2k(1 + 50 \times 0.8)$

$R_{if} = 82\ k\Omega$

$R_{of} = 500(1 + 50 \times 0.8) = 20500\ \Omega = 20.5\ k\Omega$

74. What is the topology of given circuit?



A. Voltage Series

B. Voltage Shunt

C. Current Series

D. Current Shunt

Ans. B

Sol.: R_j is the feedback element and it is connected to the output node directly, so voltage sampling is done.

Also, R_j is connected to input node of BJT hence shunt missing is there. (since capacitor C is present, R_E is so topology is Voltage shunt.

75. The gain of an amplifies without feedback is given by A= 1000± 100. The deviation in gain creates 0.2 % of deviation in gain with negative feedback. The feedback factor is

A. 10% B. 0.9%

C. 4.9% D. 5.7%

Ans. C

Sol.: $A_F = \dfrac{A}{1+A\beta}$

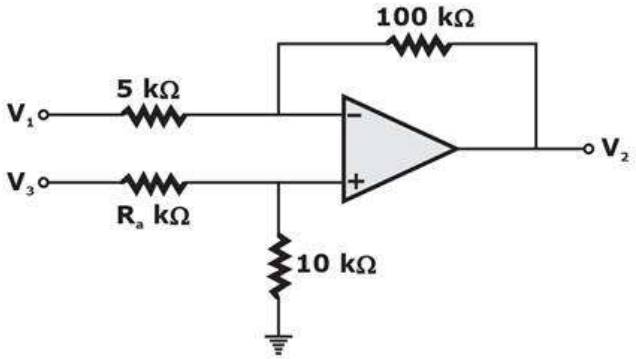
$$\frac{dA_F}{A_F} = \frac{dA}{A}\cdot\frac{1}{1+A\beta} \pm \frac{0.2}{100} = \pm\frac{100}{1000}\cdot\frac{1}{1+1000\beta}$$

1 + 1000β = 50

$$\beta = \frac{49}{1000} = 0.049 \text{or} 4.9\%$$

76. The value of R_a is _____kΩ if

$$V_2 = \frac{V_3}{3} - 2V_1$$



A. 40 B. 60

C. 80 D. 100

Ans. C

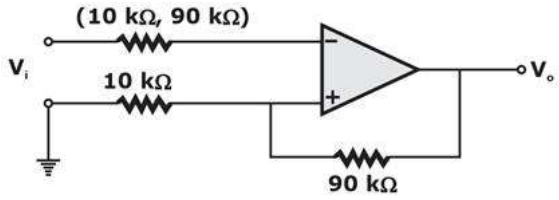
Sol.: $V_{01} = -\dfrac{R_f}{R_1}V_1 = -\dfrac{10K}{5K}V_1 = -2V_1$

$$V_{02} = \left(1-\frac{R_f}{R_1}\right)V_A = \left(1+\frac{1OK}{5K}\right)\times\left(\frac{10K}{R_a+10K}\right)V_3$$

$$\frac{V_3}{3}2V_1 = -2V_1 + \frac{30kV_3}{R_a+10K}$$

$$\boxed{R_a = 80k\Omega}$$

77. For Schmitt Trigger shown, Hysteresis is _____Volts.



Provided: V_H = 10 V & V_L = −10 V

A. 2 B. 4

C. 6 D. 8

Ans. A

Sol.: Option A is correct

R_1 = 10 kΩ

R_2 = 90 kΩ

V_H = 10 V

V_L = −10 V

$$V_{Hys} = 2\times 10\times \frac{R_1}{R_1+R_2} = 20\times \frac{10}{1000} = 2V$$

78. The correct statement regarding CMRR of an operational amplifier is:

A. High value of CMRR is preferred.

B. It is the ability of the amplifier to reject differential signals.

C. It is the ratio of common mode gain to the differential gain.

D. None of the above.

Ans. A

Sol.: CMRR is the ability of amplifier to reject common mode signals and is given by:

$$\text{CMRR} = \frac{A_d}{A_{cm}}$$

Here A_d is differential gain, A_{cm} is common mode gain.

Higher CMRR means the better is the matching two input terminals.

79. The voltage that must be applied between two input terminals of an op-amp to null the output is called:

A. Output offset voltage. B. Input offset voltage.

C. Slew rate. D. Knee voltage.

Ans. B

Sol.: Due to manufacturing process, the output op-amp may be non-zero without any voltage applied to the input. To make zero, a differential DC voltage is required between the input terminals which is known as input offset voltage.

80. The effect of negative feedback is/are:

1. Decrease in voltage gain.
2. Increase in harmonic distortion.
3. Increase in noise.
4. Decrease in bandwidth.

A. 1, 2 and 3 B. 2 Only

C. 1 and 4 D. 1 and 2

Ans. D

Sol.: Gain with feedback,

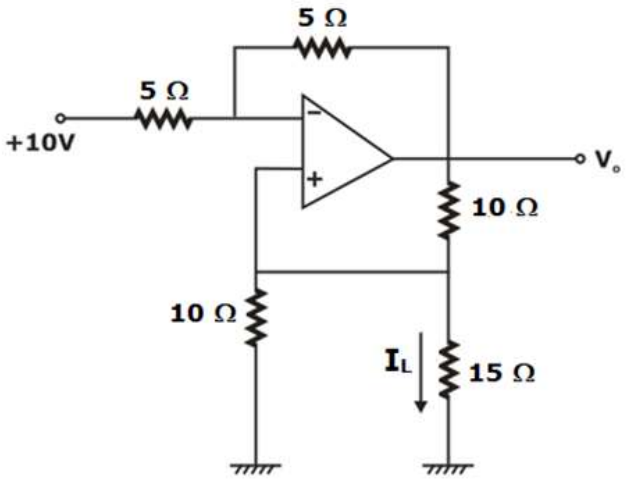
$$A_f = \frac{A}{1+A\beta} \rightarrow \text{reduce}$$

Harmonic distortion, $D_f = \frac{D}{1+A\beta} \rightarrow \text{reduce}$

Bandwidth, $B.W._{(feedback)} = B.W.(1 + A\beta) \rightarrow$ Increase

Noise, $\frac{N_0}{1+A\beta} \rightarrow \text{increase}$

81. For the below circuit, load current (I_L) is _____A.



A. 1 B. –1

C. 2 D. –2

Ans. B

Sol.: Applying KCL at (V^-)

$$\frac{10-V_1}{5} + \frac{V_0-V_1}{5} = 0$$

$10 - V_1 + V_0 - V_1 = 0$

$V_0 = 2V_1 - 10$ … (1)

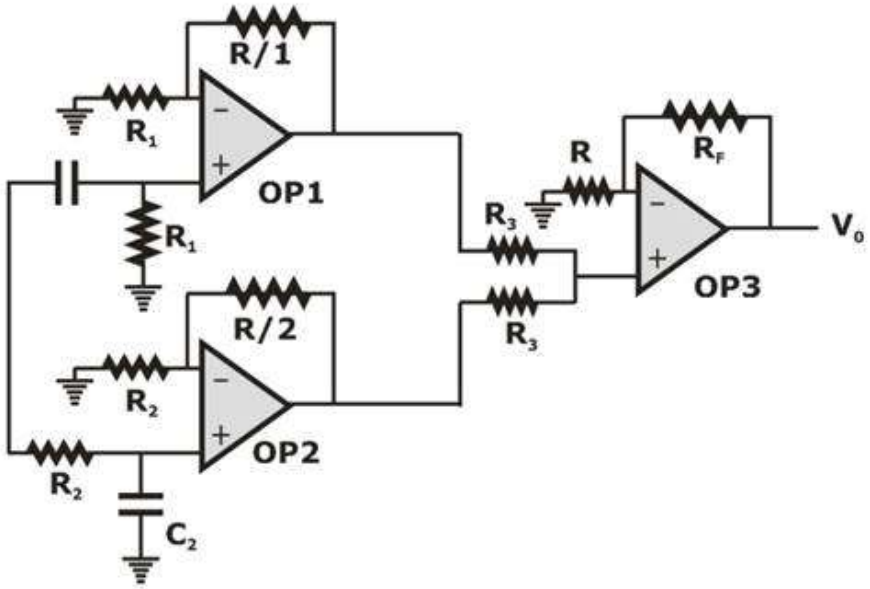
$$\frac{V_1}{10} + I_L + \frac{V_1 - V_0}{10} = 0$$

$$I_L = \frac{-2V_1 + V_0}{10} \quad \ldots (2)$$

Using (1) & (2),

$$I_L = \frac{-10}{10} = -1 \text{ A}$$

82. Identify the type of circuit shown in the figure.



A. Band Pass Filter

B. Band stop Filter

C. Instrument Amplifier

D. Narrow band video amplifier.

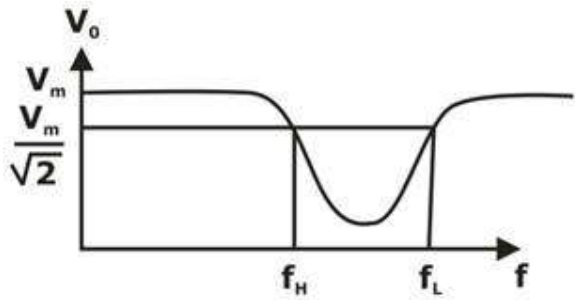
Ans. B

Sol.: OP1 shown is a high pass filter

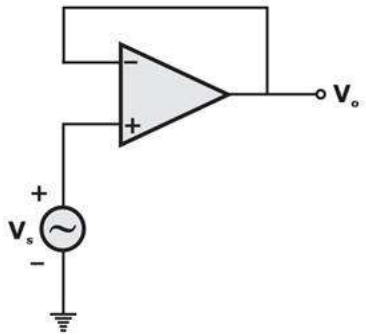
OP2 shown is a low pass filter

And OP3 is a summing circuit

So, the output will be



83. For the voltage follower circuit shown if open loop gain is 2, then close loop gain is:



A. 0.33 B. 0.66

C. 0.75 D. 1

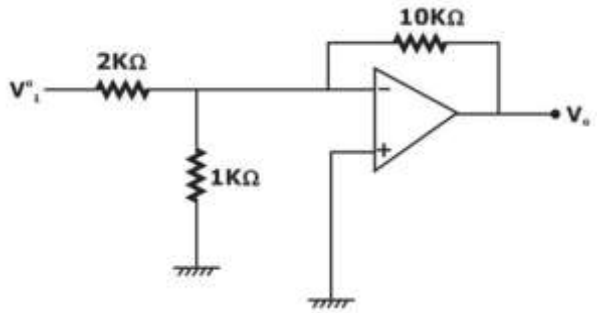
Ans. B

Sol.: $A_{OL} = 2$

$\beta = 1$ (Voltage follower)

$$A_{CC} = \frac{A}{1+A\beta} = \frac{2}{1+(1\times 2)} = 0.66$$

84. Under ideal consideration for circuit components, input impedance seen is _____Ω.

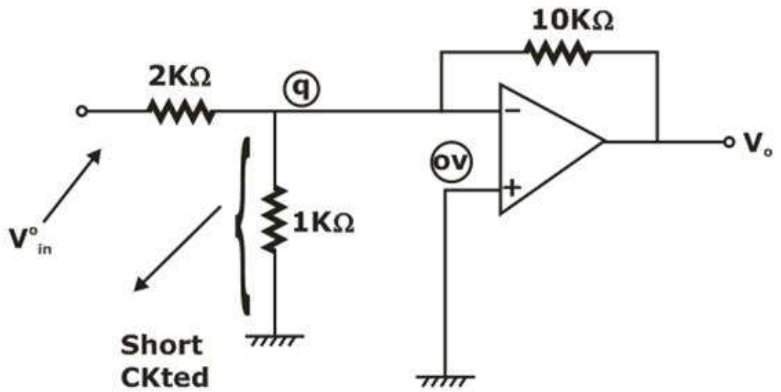


A. 1 B. 2

C. 1000 D. 2000

Ans. D

Sol.: Under ideal case virtual ground theory is applicable



So, Z_{in} = 2 kΩ = 2000 Ω

85. Piezoelectric effect is utilized in which of the following filter?

A. Ideal filter
B. Band pass
C. Band stop
D. Crystal filter

Ans. D

Sol.: A crystal filter is produces by using a quartz crystal unit having a stable frequency & sleep resonance characteristic relative to the temperature charges.

86. Consider the following statements:

1) A Hartley oscillator circuit uses a tapped inductor for inductive feedback.

2) Oscillator circuit can be operated in class A condition for better wave shape.

3) Frequency stabilization is obtained by use of automatic biasing.

Which of these statements are correct?

A. 1, 2 and 3
B. 1 and 2
C. 2 and 3
D. 1 and 3

Ans. B

Sol.: For frequency stabilization biasing is done such that operating point lies in linear range of transistor characteristic i.e. near to middle of DC load line not by automatic biasing.

87. To sustain oscillation, the required condition for oscillator is:

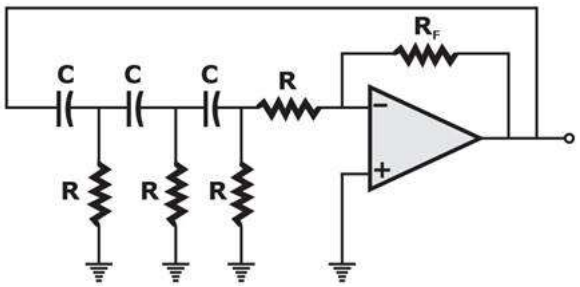
A. $|A\beta| = 1$
B. $-1 \le A\beta < \infty$
C. $|A\beta| \neq 1$
D. $A\beta = 2$

Ans. A

Sol.: To sustain oscillator,

$\boxed{|A\beta| = 1} \rightarrow$ always

88. For RC phase shifter shown, R_F is _____kΩ., provided f_0 = 65 kHz.



C = 100 pF and R = 10 kΩ

A. 290
B. 300
C. 310
D. None of the above

Ans. A

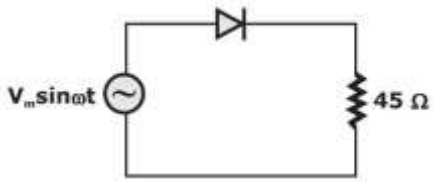
Sol.: $A\beta \ge 1$

$$|A| \ge \frac{R_f}{R_1} \ge 29$$

$R_f \geq 29R_1$

$\boxed{R_f \geq 290k\Omega}$

89. The forward resistance of the diode shown in figure is 5 Ω and the remaining parameters are same as those of ideal diode. The DC component present in the source current is



A. $\frac{V_m}{50\sqrt{2}\pi}$

B. $\frac{V_m}{50\pi}$

C. $\frac{V_m}{\pi\sqrt{2}}$

D. $\frac{2V_m}{50\pi}$

Ans. B

Sol.: DC component of current source is

$\Rightarrow \frac{V_m}{\pi R} = \frac{V_m}{\pi(5+45)}$

90. In a loaded Zener regulator, which is the largest current?

A. Load current

B. Series current

C. Zener of the above

D. None of the above

Ans. A

Sol.: In a loaded Zener regulator, load current is largest.

91. A PN junction diode is a/an

A. Bidirectional component

B. Unidirectional component

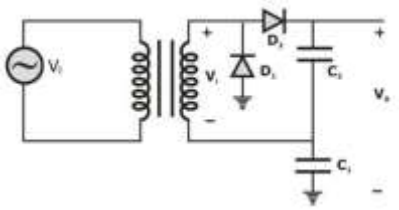
C. Non-linear component

D. Both B & C

Ans. D

Sol.: PN junction diode conducts only when it is forward biased hence it is a unidirectional non-linear component.

92. What is the output voltage of the given circuit in steady state ?



$V_i = 10 \sin\omega t$

A. 10V

B. 20V

C. 15V

D. 0V

Ans. B

Sol.: During first negative cycle D_1 ON and D_2 OFF. C_1 Capacitor charges up to real value V_{c1}= 10V

During next positive cycle D_1 is off and D_2 is ON C_2 capacitor charges up to real value V_{C2} = 10 V.

Now C_1 and C_2 will retain their voltages until a discharge path is available.

$V_0 = V_{c1}+V_{C2} = 10+10=20V$.

93. A clamper circuit

1) Adds or subtracts a dc voltage to or from a waveform

2) Does not change the shape of the waveform

Which of the above statements are correct?

A. 1 only B. 2 only

C. Both 1 and 2 D. Neither 1 nor 2

Ans. C

Sol.: A clamper circuit can be add subtract the DC voltage to or from a waveform. The frequency of the waveform remains unaffected. Moreover, the shape remains unaltered with the addition of DC-voltage. Hence, shape of waveform remains same before and after clamping.

94. Common emitter current gain h_{EE} of a BJT is

A. Always constant B. Dependent on collector current

C. Dependent on base emitter voltage D. Dependent on collector-emitter voltage

Ans. B

Sol.: Common emitter current gain h_{Fe} is defined by the ratio of collector current base current.

95. Which of the following is not a FET parameter?

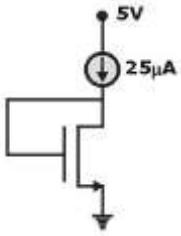
A. Drain resistance B. Transconductance

C. Trans resistance D. Amplification factors

Ans. C

Sol.: Trans-resistance is not a parameter of FET.

96. Consider the circuit shown in the figure below:



V_{Th} = 0.6 V and $\frac{\mu_n C_{ox} W}{L} = 0.2\text{mA/V}^2$. The value of V_{DS} is

A. 1.1 V B. 0.83 V

C. 0.63 V D. 1.32 V

Ans. A

Sol.: Here $V_D = V_G$

$$\Rightarrow V_{OS} > V_{GS} - V_t$$

Hence, MOSFET is in saturation,

$$I_D = \frac{1}{2}\frac{\mu_n C_{ox} W}{L}\left(V_{GS} - V_T\right)^2$$

$$0.025 = \frac{1}{2} \times 2\left(V_{GS} - V_t\right)^2$$

$$\Rightarrow 0.5 = V_{GS} - 0.6$$

$V_{GS} = 1.1$ V

But $V_{GS} = V_{DS}$

Hence, $V_{DS} = 1.1$ V

97. Three amplifiers with higher cut-off frequency as 5kHz, 7.5kHz and 9 kHz are cascaded in series. What is the higher cut off frequency of resulting circuit?

A. 3.43 kHz
B. 7.166 KHz
C. 9. kHz
D. None of these.

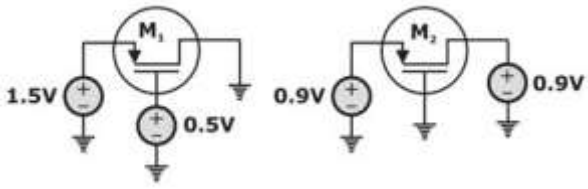
Ans. A

Sol.: In series cascading

$$fH = \frac{1}{1.1\sqrt{fH_1^2 + \frac{1}{jH_2^2} + \frac{1}{fH_3^2}}}$$

$$fH = \frac{1}{1.1\sqrt{\frac{1}{52} + \frac{1}{7.52} + \frac{1}{92}}} = 3.43\text{kH}_2 = 3.43\text{kHz}$$

98. In the figure shown, MOSFETs M, AND M_2 are operating in ($V_{Th} = 0.4$ V)



A. M_1 is in ohmic and M_2 is in cut off region.

B. M_1 is cutoff and M_2 is in saturation region.

C. M_1 is in ohmic and M_2 is in saturation region.

D. M_1 is in saturation and M_2 is in ohmic region

Ans. D

Sol.: For M_1 : Vsg ≥V t i.e. (1.5-0.5)v> 0.4V

M_1 is ON

Assuming current saturation.

$V_{S0} \geq Vsg + Vt$

$1.5\ V \geq 1+0.4$

$1.5V \geq 1.4V$

Hence assumption is true.

For M_2 $Vsg \geq Vt$ i.e. $0.9V > 0.4V$

Hence M_2 is ON

But $V_{SD} = 0$

Hence M_2 is in ohmic region.

99. **Statement 1:** BJT has more gain bandwidth product than FET.

Statement 2: FET are more temperature stable than BJT and doesn't have secondary breakdown.

A. Statement 1 and 2 are true and Statement 2 is correct explanation of Statement 1

B. Statement 1 and 2 are true but Statement 2 is not correct explanation of Statement 1

C. Statement 1 is True but Statement 2 is false.

D. Statement 1 is false but Statement 2 is true.

Ans. B

Sol.: Both Statements are true.

The correct explanation of Statement 1 is FET have smaller voltage gain than BJT and operation of FET is limited to smaller frequencies compared to BJT.

100. In a zero current switching resonant converter, the switching loss and noise are increased due to presence of capacitive coupling called

A. Miller capacitor

B. Series resonant capacitor

C. Parallel resonant capacitor

D. Switch capacitor

Ans. A

Sol.: In a zero current switching resonant converter, the switching loss and noise are increased due to presence of capacitive coupling called miller capacitor.

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